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09/707,458	11/07/2000	Emilija M. Simic	PA990288	8681

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EXAMINER	
LIU, SHUWANG	
ART UNIT	PAPER NUMBER
2634	7

DATE MAILED: 06/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	Application No.	Applicant(s)
	09/707,458	SIMIC ET AL.
	Examiner	Art Unit
	Shuwang Liu	2634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 November 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19 and 21-26* is/are rejected.

7)☒ Claim(s) *20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Objections

1. Claims 1-16 are objected to because of the following informalities:

(1) In claim 1, line 6, change "a" to - -the- -; and

(1) In claim 16, line 10, change "a" to - -the- -.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

3. Claims 1-3, 6, 7, 10, 12, 13, 15-19, 21, 23 and 26 are rejected under 35 U.S.C. 102(a) as being anticipated by Kurihara (GB 2345619 A, see IDS, paper #6).

As shown in figures 1A, 3 and 4, Kurihara discloses

(1) regarding claim 1:

A method for providing a phase rotation of a received signal, the method comprising:

receiving one or more control signals (45 in figure 3), each control signal provided to adjust a particular characteristic (gain or phase) of one or more circuit elements (amplifier 11 or phase correction unit 14) associated with a receive signal path used to process the received signal;

determining a phase rotation corresponding to an operating state defined by the one or more control signals (page 6, lines 17-24); and

rotating (14) a phase of the received signal by an amount related to the determined phase rotation (page 9, lines 15-23).

(2) regarding claim 2:

It is well known that downconverter is a necessary basic element to be constituted in a receiver after amplifying RF received signal. Therefore, it is inherent that block 12 and 13 (in figure 3) perform downconverting and digitizing the received signal, respectively, to provide inphase (I_{IN}) and quadrature (Q_{IN}) samples (I_r and Q_r), and wherein the rotating is performed on the I_{IN} and Q_{IN} samples (by 14) to generate phase rotated I_{ROT} and Q_{ROT} samples ($I_{r'}$ and $Q_{r'}$) .

(3) regarding claim 3:

wherein resolution of the I_{ROT} and Q_{ROT}, samples is maintained the same as resolution of the I_{IN} and Q_{IN} samples since the phase correction unit (14) does not generate addition bits of resolution after A/D converter (13).

(4) regarding claim 6:

wherein the rotating is performed digitally (page 7, line 24-page 8, line 18).

(5) regarding claim 7:

wherein the phase of the received signal is rotated in discrete increments (page 6, lines 19-24 and page 12, lines 10-19).

(6) regarding claim 10:

wherein the rotating is performed at a particular designated time (page 8, line 25-page 9, line 9) such that phase discontinuity in the received signal is reduced when the one or more circuit elements are adjusted (page 13, lines 3-8).

(7) regarding claim 12:

wherein at least one control signal is provided to adjust a circuit element located directly in the receive signal path (see 14 in figure 3).

(9) regarding claim 13:

wherein the determining is performed with a look-up table (2a in figure 1A and abstract).

(10) regarding claim 15:

wherein the received signal is a CDMA signal (page 1, lines 13-15).

(11) regarding claim 16:

A method for providing a phase rotation of a received signal in a CDMA receiver unit, the method comprising:

receiving one or more control signals (45 in figure 3), each control signal provided to adjust a particular characteristic (gain or phase) of one or more circuit elements (amplifier 11 or phase correction unit 14) in a receive signal path of the receiver unit;

conditioning the received signal with the circuit elements (11) in accordance with the one or more control signals (output from 16) to generate a conditioned signal (output from 11);

downconverting (12) and digitizing the conditioned signal to generate inphase (I_{IN}) and quadrature (Q_{IN}) samples (I_r and Q_r);

determining (15) a phase rotation corresponding to an operating state defined by the one or more control signals (page 6, lines 17-24); and

rotating (14) a phase of the I_{IN} and Q_{IN} samples by an amount related to the determined phase rotation to generate phase rotated I_{ROT} and Q_{ROT} samples ($I_{r'}$ and $Q_{r'}$) (page 9, lines 15-23).

(12) regarding claim 17:

A method for adjusting a phase rotation of a received signal, the method comprising:

receiving one or more control signals (45 in figure 3), each control signal provided to adjust a particular characteristic (gain or phase) of one or more circuit elements (amplifier 11 or phase correction unit 14) associated with the receive signal path;

determining a phase shift corresponding to an operating state defined by the one or more control signals (page 6, lines 17-24); and

adjusting (14) a phase of the received signal by an amount related to the determined phase shift (page 9, lines 15-23).

(13) regarding claim 18:

A receiver unit comprising:

a receiver (figures 1A and 3) operative to receive and condition a received signal (41) in accordance with one or more control signals (45) to generate a conditioned

signal (output from 11), wherein the receiver includes one or more circuit elements (amplifier 11 or phase correction unit 14) having one or more characteristics (gain or phase) that are adjustable by the one or more control signals (45);

a controller (31 and 15) coupled to the receiver and operative to determine a phase rotation corresponding to an operating state defined by the one or more control signals (page 6, lines 17-24); and

a phase rotator (14) coupled to the receiver and operative to receive and rotate a phase of the conditioned signal by an amount related to the determined phase rotation (page 9, lines 15-23).

(14) regarding claim 19 (see claim 2 above):

wherein the receiver is operative to downconvert and digitize the conditioned signal to provide inphase (I_{IN}) and quadrature (Q_{IN}) samples (I_r and Q_r), and

wherein the phase rotator (14) rotates the phase of the I_{IN} and Q_{IN} samples (I_r and Q_r)to generate phase rotated I_{ROT} and Q_{ROT} samples ($I_{r'}$ and $Q_{r'}$).

(15) regarding claim 21:

further comprising:

a demodulator (31) coupled to the phase rotator and operative to process the I_{ROT} and Q_{ROT} samples ($I_{r'}$ and $Q_{r'}$) to provide pilot symbols and data symbols (see figure 7), and to coherently demodulate the data symbols with the pilot symbols to generate recovered data (to 32) (page 8, lines 19-25).

(16) regarding claim 23:

wherein the phase rotator is operative to provide phase rotation in discrete increments (page 6, lines 19-24 and page 12, lines 10-19).

(17) regarding claim 26:

A receiver unit for use in a CDMA communications system, the receiver unit comprising:

a receiver (figures 1A and 3) operative to receive and condition a received signal(41) in accordance with one or more control signals (45) to generate a conditioned signal (output from 11), the receiver further operative to downconvert (12 refers to claim 2 above) and digitize (13) the conditioned signal to provide inphase (I_{IN}) and quadrature (Q_{IN}) samples (I_r and Q_r), wherein the receiver includes one or more circuit elements (amplifier 11 or phase correction unit 14) having characteristics (gain and phase) that are adjustable by the one or more control signals (45);

a controller (31 and 15) coupled to the receiver and operative to determine a phase rotation corresponding to an operating state defined by the one or more control signals (page 6, lines 17-24);

a phase rotator (14) coupled to the receiver and operative to receive and rotate a phase of the I_{IN} and Q_{IN} samples (I_r and Q_r) by an amount related to the determined phase rotation to generate phase rotated I_{ROT} and Q_{ROT} samples ($I_{r'}$ and $Q_{r'}$) (page 9, lines 15-23); and

a demodulator (31) coupled to the phase rotator and operative to process the I_{ROT} and Q_{ROT} samples ($I_{r'}$ and $Q_{r'}$) to provide pilot symbols and data symbols (see figure

7), and to coherently demodulate the data symbols with the pilot symbols to generate recovered data (to 32) (page 8, lines 19-25).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kurihara (GB 2345619 A) in view of Kanzaki (US 5,579,346).

Kurihara discloses all of the subject matter as described above (claim 1) except for specifically teaching that the rotating is performed by a complex multiplier.

Kanzaki, in the same field of endeavor, teaches that the rotating is performed by a complex multiply (408 in figure 3 and 608 in figure 5).

It would be desirable to use a conventional and simpler circuit to perform phase rotation to the baseband signals which subjected to the orthogonal demodulation in complex plane and thereby to correct the frequency error. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use complex multiplier as taught by Kanzaki in the phase correction unit (14) of Kurihara in order to reduce cost to perform phase rotation to the baseband signals which subjected

to the orthogonal demodulation in complex plane and thereby to correct the frequency error.

6. Claims 4, 9, 11 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurihara (GB 2345619 A) in view of Younis et al. (US 6,134,430).

Kurihara discloses all of the subject matter as described above except for specifically teaching that

(1) regarding claims 4 and 9, phase rotation has two or more bits (4 bits) of resolution; and

(2) regarding claims 11 and 25, at least one control signal is provided to switch the received signal through a plurality of signal paths, each signal path associated with a particular phase.

Younis et al., in the same field of endeavor, teaches that (1) ADC has four bits of resolution (column 20, lines 1-2) on which the resolution of phase rotation depends; and (2) at least one control signal is provided to switch the received signal through a plurality of signal paths (see figure 2, for example, bypass 122a and amplifier 1220a) (column 6, line 14-column 7, line 24), each signal path associated with a particular phase (it is well known that the bypass without amplify and amplify are corresponding to different phases).

One skilled in the art would have recognized that the nature of various bit resolution that can be selected is dependent on the respective application. The four bits and 12 bits resolutions are used in correspondence with different dynamic range

required (column 19, line 55-column 21, line 35), for example, in order to maintain +18 dB above the noise floor, ADC with four bits resolution is utilized to quantize the desired signal. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use four bits resolution as taught by Younis et al. in the A/D converter of Kurihara in order to achieve the required dynamic range and maintain +18 dB above the noise floor. In so doing, the receiver can minimize power consumption by using the appropriate ADC.

Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have at least one control signal provided to switch the received signal through a plurality of signal paths as taught by Younis et al. in the receiver of Kurihara in order to control the gain of amplifier. In so doing, the receiver optimizes the receiver performance.

7. Claims 8 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurihara (GB 2345619 A) in view of van Wechel et al. (US 6,567,833).

Kurihara discloses all of the subject matter as described above except for specifically teaching that the rotating is performed in 90^0 increments.

van Wechel et al., in the same field of endeavor, teaches that the rotating is performed in 90^0 increments (column 13, line 61-column 14, line 20).

One skilled in the art would have recognized that the nature of various phase rotation that can be selected is dependent on the respective application. The rotation performed in 90^0 increments is simple to implement and do not affect the magnitude of

the vector of the rotation. It would have been obvious to one of ordinary skill in the art at the time of the invention to have the rotation in 90^0 increments as taught by van Wechel et al. in the phase correction unit 14 of Kurihara so as to provide simple implement to correct the phase shift.

8. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kurihara (GB 2345619 A) in view of Norman (US 4,831,573).

Kurihara discloses all of the subject matter as described above except for specifically teaching that the look-up table is programmable.

Norman teaches that the look-up table (418) is programmable (abstract).

It is desirable to implement the look-up table as programmable for less expense, adaptability, and flexibility. Therefore, it would have been obvious to have used the programmable look-up table as taught by Norman in order to reduce cost and improve the adaptability and flexibility of the communication system.

9. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kurihara (GB 2345619 A) in view of Lundby et al. (US 6,285,655).

Kurihara discloses all of the subject matter as described above (claim 21) except for specifically teaching that the demodulator includes a pilot correlator operative to recover the pilot symbols from the I_{ROT} and Q_{ROT} samples, and a data correlator operative to recover the data symbols from the I_{ROT} and Q_{ROT} samples.

Lundby et al. teaches a CDMA receiver (figure 4) in which the demodulator includes a pilot correlator (326 a) operative to recover the pilot symbols from the I and Q samples, and a data correlator (322a) operative to recover the data symbols from the I and Q samples.

One skilled in the art would have recognized that the pilot and data correlator comprised of the demodulator are basic elements in the CDMA receiver in accordance with the IS-95 standard. The pilot correlator assists the remote station to perform coherent demodulation of the received signal. The data correlator assists to recover the data from the received signal. It is desirable to have higher system capacity, smaller fading effect, wider bandwidth, and minimum interference between the code channels by using pilot and data correlators in the CDMA system. Therefore, it would have been obvious to include the pilot and data correlators as taught by Lundby et al. in the demodulator 31 of Kurihara in order to achieve higher system capacity, smaller fading effect, wider bandwidth, and minimum interference between the code channels and provide better performance for the receiver.

Allowable Subject Matter

10. Claim 20 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. The following is a statement of reasons for the indication of allowable subject matter: the prior fails to teach and suggest the phase rotator includes a first set of multiplexers, a first set of exclusive-OR gates, a second set of multiplexers, and a second set of exclusive-OR gates as recited in claim.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shuwang Liu whose telephone number is (703) 308-9556.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin, can be reached at (703) 305-4714.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

Shuwang Liu
Primary Examiner
Art Unit 2634

June 10, 2003